SCIENCE LESSON PLAN
KIMCHI

DATE: 06/13/2012
LESSON TOPIC: Pollution Filtering Experiment

OBJECTIVES/STUDENT LEARNING OUTCOMES:
- Students will be able to identify potential hazards and safety precautions for the Pollution Filtering Experiment.
- Students will be able to identify the variables involved in the Oil Spill Experiment.
- Students will be able to identify whether their pollution has been cleaned up.
- Students will be able to justify their conclusion about the "cleanliness" of their pollution by citing supportive data gathered during the investigation.

GRADE LEVEL INDICATORS:
- ST 1. Investigate positive and negative impacts of human activity on the environment.
- SI 3. Use evidence and observations to explain and communicate the results of investigations.
- SI 4. Identify one or two variables in a simple experiment.
- SI 5. Identify potential hazards and/or precautions involved in an investigation.
- SWOK 2 Develop descriptions, explanations, and models using evidence to defend/support findings.

MATERIALS NEEDED:
- Picture Books: Prince William by Gloria Rand and Oil Spill by Melvin Berger.
- Newspaper
- Disposable aluminum pie pans
- Rocks
- Plants
- Pipe cleaners
- Water
- Measuring cups
- Cups
- Zipper baggies filled with supplies (See attached Materials list for Oil Spill Cleanup Lab)

INSTRUCTIONAL STRATEGY:
- Guided inquiry
- Whole class discussion

STUDENT GROUPING:
- 4 person teams
- Whole class

TEACHER-STUDENT INTERACTION:

- "Today we are going to start an investigation that will help us understand how people can influence the environment."
- "For today's experiment, we need to know what properties of materials are. Does anyone know what some properties of matter are?"
- Lead discussion of properties of matter.
  - Volume – how much space something takes up
  - Mass – how much matter there is in an object (how much stuff is there)
  - Weight – how hard gravity pulls on an object
  - Density – ("mass per unit volume" d=m/v) how closely packed something is
    - Less dense will float
    - More dense will sink
- "Sometimes people pollute water.
  - Pollution: any harmful thing produced by humans that makes the environment unclean or unhealthy
- "When we pollute water, 1 of 3 things can happen (these are usually physical changes, but they are hard to clean up):
  - the pollution can sink to the bottom of the water
    - sometimes you can separate it from the water
  - the pollution can float on top of the water
    - sometimes you can separate it from the water
  - the pollution can get mixed in with the water (dissolve into the water)
    - it's hard to separate it from the water.

Give each member a copy of the oil Spill Cleanup Checkpoint Lab.
Explain they will be following the directions on the student page. (See Page 172 Picture Perfect Science. Attached).
When all groups finish with Lab: Ask Questions at bottom of page 172.

Web site See page 174 Picture Perfect Science Attached.

EVALUATING STUDENT LEARNING:

- On their Lab sheets, students correctly identify whether their pollution has been cleaned up. It has been cleaned up if all of the pollutant is filtered out of the water.
- On their Lab sheets, students correctly justify their conclusion about the "cleanliness" of their pollution by citing supportive data gathered during the investigation.

Oil Spill!

Description

Learners explore the effects of oil spills on plants, animals, and the environment and investigate cleanup methods through a simulated oil spill. Learners also use creative writing and letter writing to demonstrate their understandings about the effects of oil spills.

Suggested Grade Levels: 3–6

Lesson Objectives Connecting to the Standards

Content Standard A: Scientific Inquiry

K–4: Plan and conduct a simple investigation.

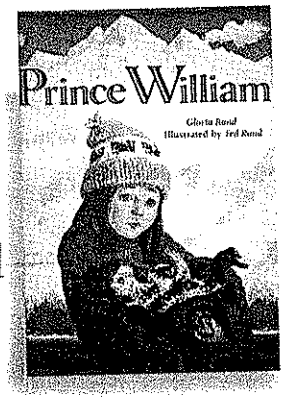
5–8: Design and conduct a scientific investigation.

Content Standard F: Science in Personal and Social Perspectives

K–4: Understand that pollution is a change in the environment that can influence the health, survival, or activities of organisms, including humans.

5–8: Understand the risks associated with chemical hazards such as pollutants in water.

Featured Picture Books



Title	***Prince William***
Author	**Gloria Rand**
Illustrator	**Ted Rand**
Publisher	**Henry Holt & Company**
Year	**1994**
Genre	**Story**
Summary	**On Prince William Sound in Alaska, Denny rescues a baby seal hurt by an oil spill and watches it recover in a nearby hospital.**

Title	***Oil Spill!***
Author	**Melvin Berger**
Illustrator	**Paul Mirocha**
Publisher	**HarperCollins**
Year	**1994**
Genre	**Narrative Information**
Summary	**Explains why oil spills occur and how they are cleaned up and suggests strategies for preventing oil spills in the future**

Time Needed

This lesson will take several class periods. Suggested scheduling is as follows:

Day 1: **Engage** with read aloud of *Prince William*

Day 2: **Explore** and **Explain** with read aloud of *Oil Spill!* and Oil Spill Cleanup Checkpoint Lab

Day 3: **Elaborate** with Animal Rescue

Day 4: **Evaluate** with Thank a Rescuer

Materials

For Oil Spill Cleanup Checkpoint Lab

In advance, make black oil by adding 8 teaspoons of powdered black tempera paint to a gallon jug half full of vegetable oil. With the lid tightly in place, shake the jug to mix the powder with the vegetable oil. This will make enough oil for 8 teams.

- Newspaper
- Disposable aluminum pie pans (3 per team)
- Rocks each no bigger than a deck of cards (3 per team)
- Leafy carrot or celery tops or plastic aquarium plants (3 per team)
- Pipe cleaners
- Water
- 3 cups for collecting removed oil for measuring
- Metric measuring cups
- Red cup and green cup with the openings taped together (1 per team)
- Zipper baggies filled with these supplies (1 per team):
  - Spoon
  - Fork
  - Yarn (about 50 cm)
  - 10 cm strip of nylon stocking
  - Cotton ball
  - Disposable pipettes
  - Coffee filter
  - 5-cm-wide strip of paper towel

Student Pages

- Oil Spill Cleanup Checkpoint Lab
- Animal Rescue
- Thank a Rescuer

Engage

Read Aloud

Inferring

Show students the cover of the book *Prince William*. Then ask

? What do you think this book might be about?

? Who do you think Prince William is?

Questioning

Say, "As I'm reading, I'm going to be telling you what I'm wondering because good readers ask questions as they read."

Begin reading to the class. Stop periodically to model some questions that come to your mind as you read. For example:

? What would an oil-covered beach look and smell like?

? Why does Denny hear a baby crying on the beach?

? What would it be like to pick up a slippery baby seal?

? Will Prince William survive?

Be sure to read the author's note at the end of the book, which explains that *Prince William* is based on true events and that schoolchildren really did help with the seal recovery efforts.

Text-to-Self:

Think-Pair-Share

After reading the story, model some text-to-self connections. For example, tell what you remember about the *Exxon Valdez* oil spill or tell about a time you helped an injured animal. Ask students if they have ever helped an animal like Denny helped Prince William. Give them a minute to think about it, and then share their experiences with a partner.

Explore & Explain

Read Aloud and Oil Spill Cleanup Checkpoint Lab

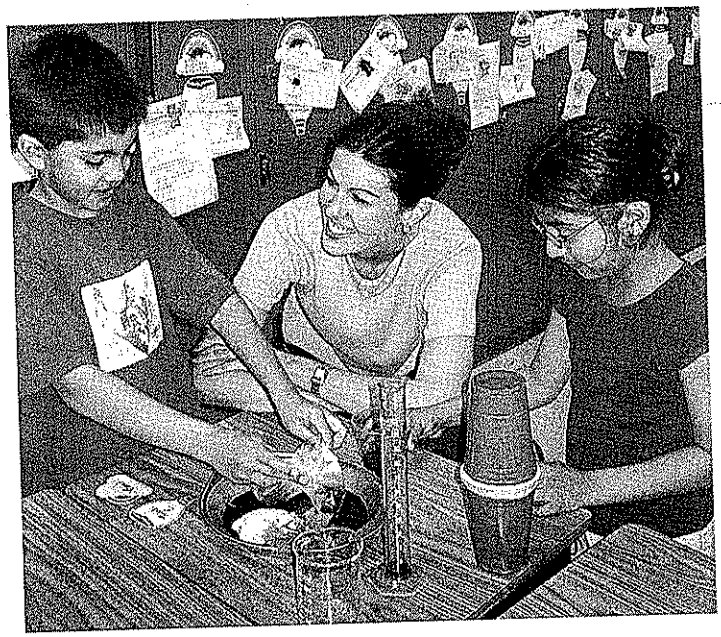
Determining Importance

Introduce the author and illustrator of *Oil Spill!* Have students jot down the methods and materials used by oil spill cleanup crews as you read *Oil Spill!* to the class.

? What methods and materials were described in the book? (using booms, skimmers, and pads; setting the oil on fire; spreading chemicals; spraying the shore; adding bacteria; or taking no action)

? Which method do you think works the best? Why? (answers will vary)

? Are there any disadvantages to any of these methods? (Pads are difficult to dispose of; fire sends smoke and gas into the air and leaves ash in the water; chemicals add poison to the water; hot spray pushes water far-



CLEANING UP A SIMULATED OIL SPILL

ther into the rocks and sand; and using bacteria requires huge amounts of it.)

After discussing *Oil Spill!*, tell students they are going to be members of an oil spill response team. An oil spill has just occurred in their region, and they must spring into action to find out which methods will work best to clean up the oil.

In advance, prepare the materials for the Oil Spill Cleanup Checkpoint Lab. See "Teaching Science Through Inquiry," Chapter 3, for a list of tips for managing a checkpoint lab.

Oil Spill Cleanup Checkpoint Lab

Divide students into four-person teams. Give each member of the team a copy of the Oil Spill Cleanup Checkpoint Lab. Explain that they will be following the directions on the student page. As they are working, they should keep their cups green side on top. If they need help or if they are at a checkpoint, they should put their cups red side on top. Each member of the group is responsible for recording data and writing responses. Before you give a team a check mark or stamp so that they can move ahead in the lab, informally evaluate the students by asking probing questions to different members of the team. Redirect their investigations when necessary.

When all groups are finished with the checkpoint lab, discuss the following questions:

- ? What did you learn about designing an experiment?
- ? Would you make any changes in your experimental design?
- ? Can you propose any new methods for cleaning up oil spills?
- ? What do you think it would be like to clean up a real oil spill like the *Exxon Valdez* spill we have been reading about?

Elaborate

Animal Rescue

Rereading

Reread pages 10 through 13 of *Oil Spill!* Then ask

- ? What types of animals were harmed by the oil spill in the book? (seabirds such as ducks and geese, fish, shrimp, crabs, sea otters, sea lions, harbor seals, and killer whales)
- ? How do oil spills harm birds? (The oil sticks to their feathers so they can't swim or fly.)
- ? How do oil spills harm fish, shrimp, and crabs? (Oil gets into their bodies and poisons them.)
- ? How do oil spills harm sea mammals? (They swallow oil and breathe poisonous fumes. The oil also coats their bodies.)

Reread the following pages in *Prince William*: pages 10 (about the doctor and volunteer), 19 (about the other animals being washed), and 20 (about Denny finding the empty incubator). Then ask

- ? Imagine that you are cleaning a real, live animal that has been oiled. What things would you need to consider to keep you and the animal safe?
- ? What would your day be like if you were an animal rescuer?
- ? What would you enjoy about being a rescuer?
- ? What parts of the job would be difficult?

Pass out the Animal Rescue student page. Tell students to imagine they are animal rescuers. Have them write a short story describing their rescue experiences. They should draw a picture to illustrate their story and write a caption for the drawing.

Evaluate

Thank a Rescuer

Pass out the Thank a Rescuer student page. Students will write letters to oil spill animal rescue organizations thanking the oil response team employees and volunteers. Use the rubric below to evaluate the letters.

Scoring Rubric for Letter

4 Point Response	The student's letter includes a statement thanking the rescuer, clearly demonstrates understanding of the oil spill activity, lists two ways oil spills can affect the health and survival of organisms, effectively communicates his or her concern about oil spills, and requests information about how kids can support cleanup efforts or prevent oil spills.
3 Point Response	The student's letter demonstrates a flaw in the understanding of the concepts OR is missing one or two elements.
2 Point Response	The student's letter demonstrates a flaw in the understanding of the concepts and is missing one or two elements OR is missing three or four elements.
1 Point Response	The student's letter demonstrates a flaw in the understanding of the concepts and is missing three or four elements OR is missing five elements.
0 Point Response	The student shows no understanding of the concepts OR does not write a letter.

Inquiry Place

Have students brainstorm "investigatable" questions such as:

Which brand of detergent is best for cleaning oiled material?

Which is best for insulating a marine animal: fur, feathers, or blubber?

Do all types of oil float on water? Of the following types of oil, olive oil, corn oil, and baby oil, which is the most dense? the least dense?

Students can select a question to investigate as a class, or have groups of students vote on the question they want to investigate as teams. After they make their predictions, students can design an experiment to test their predictions. Students can present their findings at a poster session.

Web Sites

Photos from the *Exxon Valdez* oil spill
www.oilspill.state.ak.us/facts/photos.html

Map of the *Exxon Valdez* Oil Spill Area
www.conservationgiscenter.org/maps/html/exxon_spill.html

How Oil Affects Birds
www.ibrrc.org/oil_affects.html

Clean the Oiled Sea Otter Activity
www.marinemammalcenter.org/learning/education/teacher_resources/cleanseaotter.asp

Effects of Oil on Wildlife
www.tristatebird.org/oilspill/effects_of_oil.htm

More Books to Read

D'Lacey, C. 2002. *A break in the chain.* New York, NY: Crabtree Publishing Company.
Summary: This illustrated chapter book reveals how a terrible oil spill in the Arctic, a lesson about food chains, and a computer game featuring a polar bear turn into a magical adventure for Billy, whose class uses e-mail and a fundraiser to help rescue the Arctic animals. A compelling story about environmental protection and how children can make their voices heard.

Hodgkins, F. 2000. *The orphan seal.* Camden, ME: Down East Books.
Summary: This beautifully illustrated picture book tells the true story of Howler, an abandoned harbor seal pup who was separated from his mother in a storm. Howler is rescued and rehabilitated by the New England Aquarium and eventually released back into the wild.

Meeker, CH. 1999. *Lootas: Little wave eater.* Seattle, WA: Sasquatch Books.
Summary: This fascinating photo essay describes how a young sea otter pup is rescued after its mother is accidentally killed by a motorboat. The pup, Lootas, is taken to a U.S. Fish and Wildlife Service office after her rescue and eventually finds a home in the Seattle Aquarium. Includes insets with facts about sea otters.

Smith, R. 2003. *Sea otter rescue: The aftermath of an oil spill.* New York, NY: Puffin.
Summary: When the *Exxon Valdez* struck the rocks in Prince William Sound, Alaska, nearly 11 million gallons of crude oil spilled into the water. The result was an oil slick that threatened all of the area wildlife, especially the sea otters. This is the story of the animal rescue experts who went to Alaska to help out. Illustrated with the author's own photographs, this book is a fascinating firsthand account of the heroic measures taken to save the lives of hundreds of sea otters.

Name: _____

Oil Spill Cleanup Checkpoint Lab

You are a member of an oil spill response team. An oil spill has just occurred in your region and you must spring into action to find out which methods will work best to clean up the oil! If your team is working, put the green cup on top. If you have a question, put the red cup on top. If you are finished with a part and you are ready for a check from your teacher, put the red cup on top.

Part A Setting Up an Oil Spill Simulation

☑ *Check the boxes as your team completes each step.*

☐ Cover your work area with newspaper.

☐ Get three aluminum pie pans from your teacher.

☐ Place one rock in each of the pans to represent the shore.

☐ Place a plant in each to represent shoreline plants.

☐ Make three models of animals out of pipe cleaners, and place the pipe cleaner animals on the edge of the rocks.

☐ Fill the pan with 250 ml of water.

☐ Get some simulated black oil from your teacher, and add 75 ml of the black oil mixture to each pan. Have one person from your group gently blow across the top of the pan to simulate wind and waves.

Note: The reason you are not using real petroleum oil is that it is toxic and should never be handled by children.

Describe what happens when someone blows across the water.

_____

_____

Checkpoint A ☐

Name: _____

Oil Spill Cleanup
Checkpoint Lab cont.

Part B Design an Experiment to Test Cleanup Materials

1 Your job is to find out which material will remove the most oil from the pan. Choose three materials to test from the list below.

Circle your choices:

Spoon	Cotton balls
Fork	Disposable pipettes
Nylon stockings cut into strips	Coffee filters
Paper towels cut into strips	Yarn

2 Make a prediction about which of the three materials will remove the most oil from the pan. Explain why you chose that material.

_____

_____

3 How will you decide which material removed the most oil? You can use the 3 plastic cups for measuring removed oil.

_____

_____

4 Write a step-by-step procedure for your experiment:

_____

_____

_____

_____

Checkpoint B ☐

Name: _____

Oil Spill Cleanup

Checkpoint Lab cont.

Part C Data and Conclusions

1 You are now ready to test three cleanup materials. Collect your data and organize it in a table below.

2 What effects did the oil spill have on the simulated environment?

_____

_____

3 Conclusion: Which material was best for cleaning up the oil spill? What is your evidence?

_____

_____

4 If you were going to repeat this experiment, what would you do differently? Why?

_____

_____

_____

Checkpoint C ☐

CHAPTER 13

Author: _____

Animal Rescue

Imagine that you are an animal rescuer. Write a short story describing your rescue experiences. Draw a picture to illustrate your story, and write a caption for the picture.

Caption _____

_____

_____

CHAPTER 13

Thank a Rescuer

Write a letter thanking an oil spill animal rescue worker or volunteer involved in one of the organizations listed below. Include the following in your letter:

- a statement thanking the oil spill rescue worker
- a description of the activity you did to clean up an oil spill and what you learned
- 2 ways oil spills affect the health and survival of organisms
- what concerns you most about oil spills
- a request for information on how kids can help support cleanup efforts or prevent oil spills (Ask them to send the information to your teacher at your school address.)

Oil Spill Animal Rescue Organizations

International Bird Rescue
Research Center
4369 Cordelia Road
Fairfield, CA 94534

Marine Mammal Center
1065 Fort Cronkhite
Sausalito, CA 94965

Oiled Wildlife Care Network
Wildlife Health Center
University of California
Davis, CA 95616

SeaWorld & Busch Gardens
Conservation Fund
c/o Hubbs-SeaWorld Research
Institute
2595 Ingraham Street
San Diego, CA 92109

Tri-State Bird Rescue & Research
110 Possum Hollow Road
Newark, DE 19711